Green, C., Morrison, H., Smith, P., Golestani, F., Rice, C., Coulthard, E., Searle, J., & Lyburn, I. (2021). Teaching Neuroimages: COVID-19 associated acute disseminated encephalomyelitis with corpus callosal hemorrhage. *Neurology*, *96*(2), e307-e308. https://doi.org/10.1212/WNL.0000000000011001

Teaching Neuroimages: COVID-19 associated acute disseminated encephalomyelitis with corpus callosal hemorrhage

Author(s):
Christopher Green, FRCR; Hamish Morrison, MRCP; Paul Smith, FRCR; Farhad Golestani, FRCP, MD; Claire Rice, FRCP, PhD; Elizabeth Coulthard, FRCP, PhD; Julie Searle, FRCR; Iain Lyburn, FRCR

Equal Author Contributions:
Christopher Green & Hamish Morrison contributed equally to the manuscript as first co-authors.

Corresponding Author:
Christopher Green
c.green10@nhs.net

Affiliation Information for All Authors: Christopher Green, Gloucestershire Hospitals NHS Foundation Trust, Gloucester, GL1 3NN, UK; Hamish Morrison, Gloucestershire Hospitals NHS Foundation Trust, Gloucester, GL1 3NN, UK; Paul Smith, Gloucestershire Hospitals NHS Foundation Trust, Gloucester, GL1 3NN, UK; Farhad Golestani, Gloucestershire Hospitals NHS Foundation Trust, Gloucester, GL1 3NN, UK; Claire Rice, North Bristol NHS Trust, Bristol, BS10 5NB, UK; Elizabeth Coulthard, North Bristol NHS Trust, Bristol, BS10 5NB, UK; Julie Searle, Gloucestershire Hospitals NHS Foundation Trust, Gloucester, GL1 3NN, UK; Iain Lyburn, Cobalt Medical Charity, Cheltenham, GL53 7AS, UK.

Contributions:
Christopher Green: Drafting/revision of the manuscript for content, including medical writing for content
Hamish Morrison: Drafting/revision of the manuscript for content, including medical writing for content
Paul Smith: Drafting/revision of the manuscript for content, including medical writing for content
Farhad Golestani: Drafting/revision of the manuscript for content, including medical writing for content
Claire Rice: Drafting/revision of the manuscript for content, including medical writing for content
Elizabeth Coulthard: Drafting/revision of the manuscript for content, including medical writing for content
Julie Searle: Drafting/revision of the manuscript for content, including medical writing for content
Iain Lyburn: Drafting/revision of the manuscript for content, including medical writing for content

Number of characters in title: 80

Abstract Word count: 0

Word count of main text: 114

References: 2

Figures: 1

Tables: 1

Neuroimage Legend Count: 65

Supplemental: Patient consent form

Search Terms: [7] Intracerebral hemorrhage, [44] Acute disseminated encephalomyelitis, [120] MRI, [360] COVID-19, [142] Viral infections

The authors report no targeted funding

Disclosures: Nothing to declare.

A 55-year-old male with severe COVID-19 required ventilation and hemofiltration. Central venous catheter thrombosis necessitated heparin infusion. On day 20 post admission, impaired conscious level, complex ophthalmoplegia and hyper-reflexia prompted non-contrast neuroimaging demonstrating corpus callosal and right sub-insular hemorrhage with diffuse white matter signal change (figure 1). CSF analysis was not performed due to clinical concerns regarding raised intracranial pressure. Administration of high dose corticosteroids led to clinical and radiological improvement (figure 1).

The differential diagnosis of infective splenial lesions is presented (table 1).[1] Here, we consider the likely diagnosis to be acute disseminated encephalomyelitis with hemorrhage adding to the clinical spectrum of neurological complications of COVID-19 and highlighting the possibility of favorable outcome.[2]

Appendix 1 : Authors

Name	Location	Position	Contribution
Christopher Green, FRCR	Gloucestershire Royal Hospital, UK	Radiology Registrar	Report drafts and final submission
Hamish Morrison, MRCP	Gloucestershire Royal Hospital, UK	Neurology Registrar	Report drafts and final submission
Paul Smith, FRCR	Gloucestershire Royal Hospital, UK	Consultant Neuroradiologist	Reported imaging and manuscript revision
Farhad Golestani, FRCP MD	Gloucestershire Royal Hospital, UK	Consultant Neurologist	Clinical care of patient and manuscript revision
Claire Rice, FRCP PhD	North Bristol NHS Trust, UK	Consultant Neurologist	Clinical care of patient and manuscript revision
Elizabeth Coulthard, FRCP PhD	North Bristol NHS Trust, UK	Consultant Neurologist	Clinical care of patient and manuscript revision
Julie Searle, FRCR	Gloucestershire Royal Hospital, UK	Consultant Radiologist	Revision of manuscript
Iain Lyburn, FRCR	Gloucestershire Royal Hospital, UK	Consultant Radiologist	Revision of manuscript

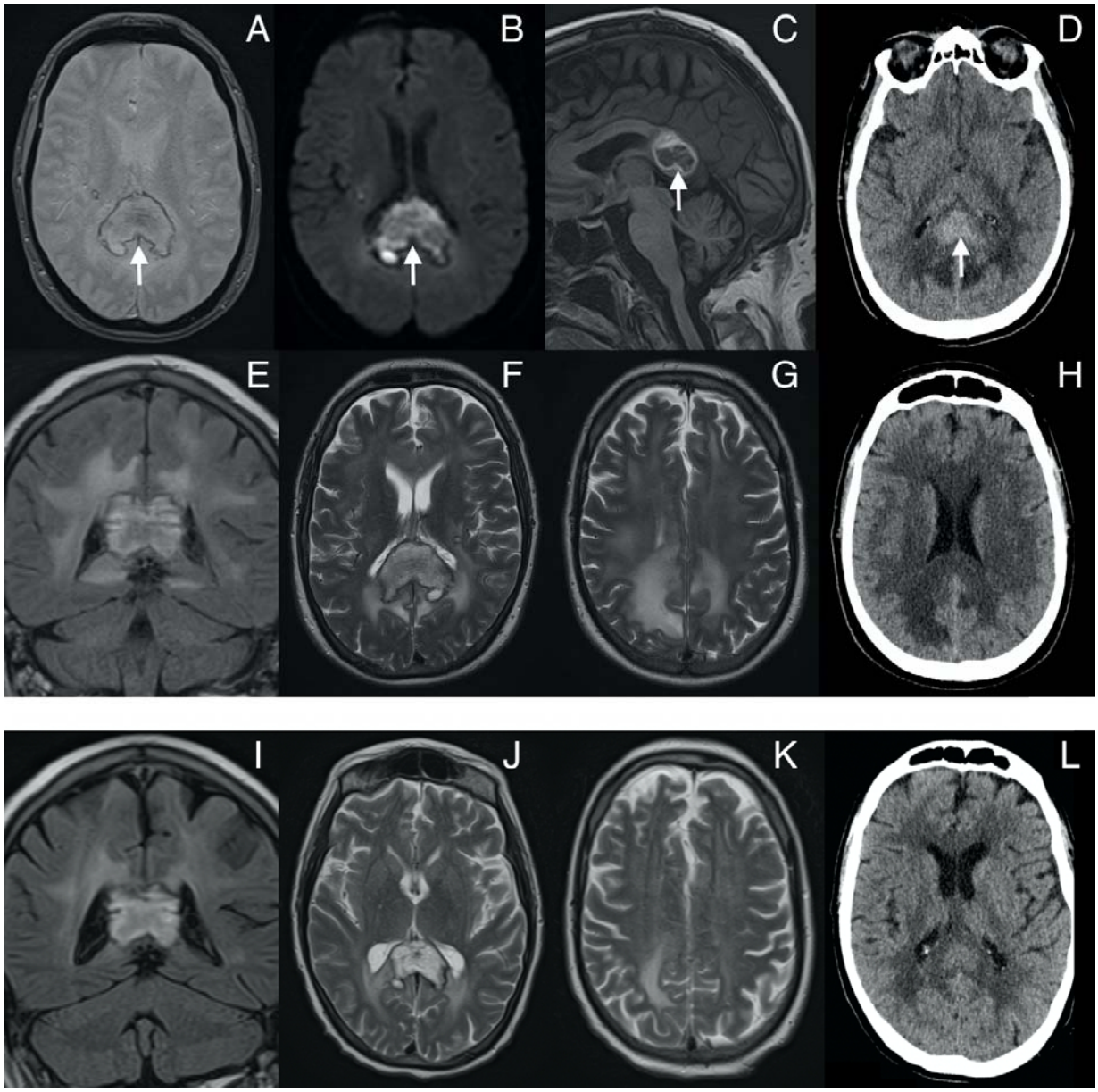
Figure 1: Initial MRI and CT with arrows highlighting peripheral low signal on T2* (A), abnormal diffusion (B), high T1 (C) and increased attenuation (D) within the corpus callosum splenium. Confluent high FLAIR (E) and T2 (F & G) abnormality and low attenuation (H) within deep cerebral white matter. Improved appearances at 2 weeks (I – L).

Table 1 : Differential diagnosis for infective splenial lesions

References

1. Blaauw J, Meiners LC. The splenium of the corpus callosum: embryology, anatomy, function and imaging with pathophysiological hypothesis. *Neuroradiology* 2020;62(5):563-85. doi: 10.1007/s00234-019-02357-z [published Online First: 2020/02/18]

2. Wang HY, Li XL, Yan ZR, et al. Potential neurological symptoms of COVID-19. *Ther Adv Neurol Disord* 2020;13:1756286420917830. doi: 10.1177/1756286420917830 [published Online First: 2020/04/15]


A
B
C
D
E
F
G
H
I
J
K
L

Viral

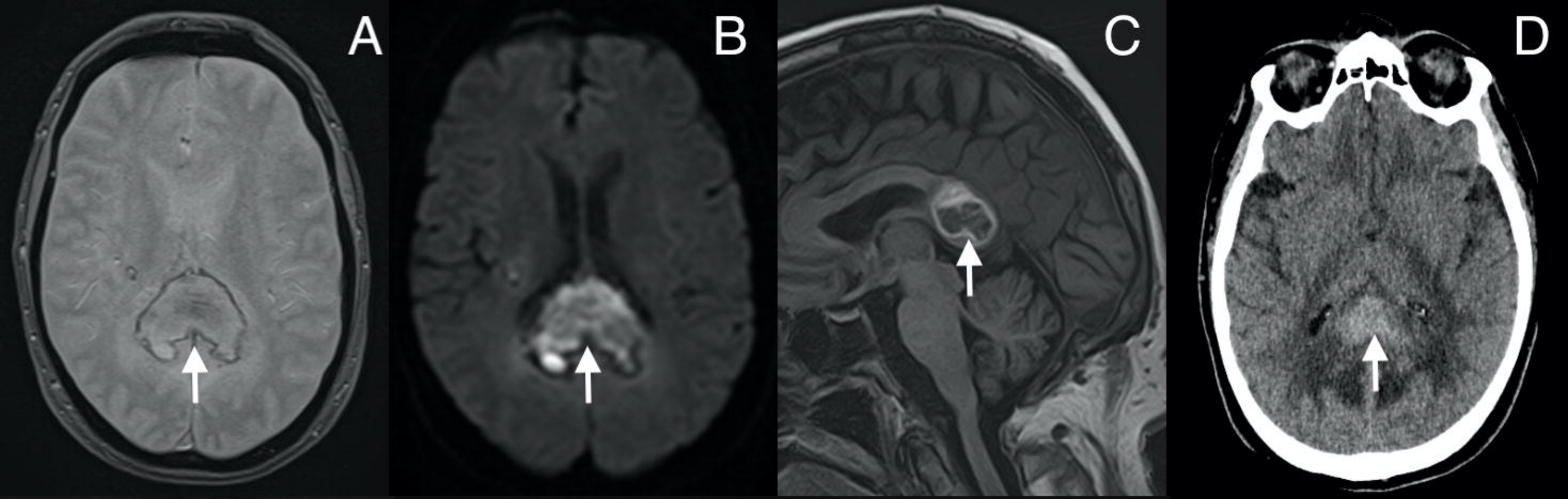
Influenza, coronavirus, rotavirus, measles, adenovirus, human parvovirus B19, cytomegalovirus, varicella-zoster, adenovirus, rubella, human herpesvirus-6, human herpes virus-7, human immunodeficiency virus, mumps, parainfluenza, enterovirus, Epstein–Barr virus

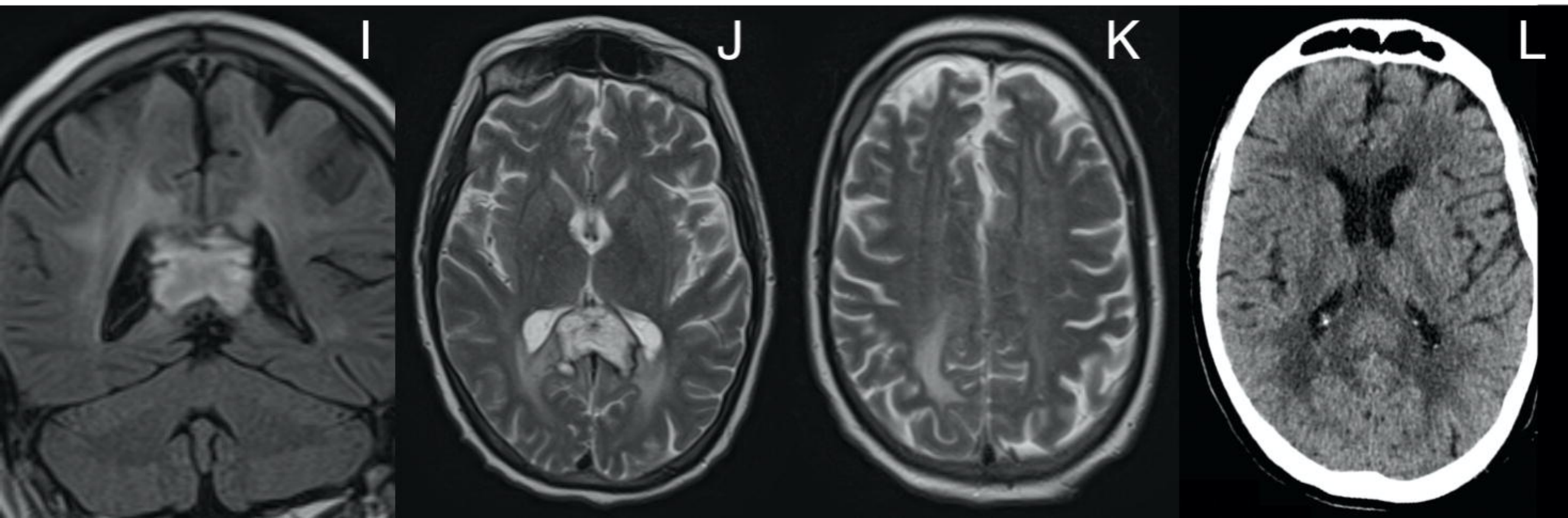
Bacterial:

Legionella pneumophila, Streptococcus pneumoniae, Salmonella enteritidis, Escherichia coli, Enterococcus faecalis, Klebsiella pneumoniae (febrile urinary tract infection), Campylobacter jejuni

Other:

Mycoplasma pneumoniae, malaria, dengue fever


A
B
C
D
E
F
G
H


I
J
K
L

Viral

Influenza, coronavirus, rotavirus, measles, adenovirus, human parvovirus B19, cytomegalovirus, varicella-zoster, adenovirus, rubella, human herpesvirus-6, human herpes virus-7, human immunodeficiency virus, mumps, parainfluenza, enterovirus, Epstein–Barr virus

Bacterial:

Legionella pneumophila, Streptococcus pneumoniae, Salmonella enteritidis, Escherichia coli, Enterococcus faecalis, Klebsiella pneumoniae (febrile urinary tract infection), Campylobacter jejuni

Other:

Mycoplasma pneumoniae, malaria, dengue fever